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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Industry-by-Industry IS Spending Survey

$32 BILLION That's How Much Top U.S. Corporations In a Dozen Industries are Investing in Information Systems this Year. But not Every Industry is Keeping Pace. Nor do Companies in the Same Industry Spend Equal Amounts. Is Your Company a Leader or a Laggard??

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

INTRODUCTION/METHODOLOGY

Photograph by Marlow/Magnum

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A DATAMATION REPORT Information systems is taking a bigger bite of revenues at the top shops in the U.S. Despite decentralization and off-budget computing, IS's cut has risen to 1.9%. This year, the total of the budgets for information systems at the top 120 companies in 12 industries will be $32 billion. In this report, the data, charts, and overviews for each sector were compiled and written for DATAMATION by the Cahners Business Research Group. The case histories were written by Tom McCusker, DATAMATION's Los Angeles Bureau Manager.

Cover Design by James Montalbano

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A Question Answered

About a year ago, DATAMATION answered the question, "What percent of revenues is the U.S. corporation budgeting for information systems?" Apparently, it was a question long asked but just as long unanswered. Since that original study was published in September 1987, hardly a day goes by without a phone call to our editorial offices thanking us for finally providing a standard for budgeting comparison.

BRG's Kim Myhre (left) and Paris Burstyn.

This year, IS executives at 120 leading U.S. companies—the top 10 companies in a dozen industry sectors—have again been extremely cooperative, giving us even more confidence in the solidity of our findings. Performing the number gathering and crunching, and writing the overviews of IS practices in each sector, was the Business Research Group (BRG), a Boston-based division of Cahners Publishing, owners and publishers of DATAMATION. Piloting the project at BRG were Kim Myhre, vice president of research and consulting, and Paris Burstyn, director of telecommunications research and consulting. Myhre is a 10-year veteran in the market research and consulting business, and his articles on the network industry have appeared in numerous industry and business publications. He has worked with International Data Corp., Harvard University, Contract Research Corp., and Energy Information Inc., and has degrees from Rutgers University and Boston University. Before joining BRG, Burstyn directed Arthur D. Little Decision Resources' Spectrum Telecommunications market research program and covered the telecommunications and computer industries for *Electronic Business* magazine. He has degrees from Boston University, Rutgers University, and the University of Colorado.

Buttressing the work of Burstyn, Myhre, and their colleagues at BRG, are a dozen case histories—one for each business sector—reported and written by the veteran computer journalist Tom McCusker. McCusker first joined DATAMATION in 1970, left for a while to work on *Ouput* and *Software News*, and returned to DATAMATION as Los Angeles Bureau Manager. McCusker began his journalism career in Toronto with the Canadian Press, Canada's wire service. After moving to the States, he pursued business journalism, as an editor of metalworking and electronics magazines and as the writer and broadcaster of a daily business report on Los Angeles radio stations.

Putting all this information together, making it readable, making the data clear, was a team of copy editors, designers, and production specialists. Chief among them were designers Anthony Kosner and James Montalbano, copy editor Estelle Silberman, and production magician Catherine Kennedy. Editorial assistant Karen J. Scher also pitched in, gathering bits and pieces of information that, to readers, may seem to appear almost automatically, but, without which, publication would be impossible.

—Parker Hodges, Managing Editor

DATAMATION

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Industry By Industry IS Survey

IS is taking a bigger bite of revenues at top shops. Despite decentralization and off-budget computing, IS's cut has risen to 1.9%. This year, the total budgets for information systems at the top 120 companies in 12 industries will be $32 billion.

A DATAMATION REPORT

DATAMATION surveyed 120 of the country's largest corporations to determine the value and the nature of their information systems expenditures. The survey of the top 10 firms in 12 industry sectors reveals a healthy aggregate growth among these corporate giants, and a consequent rise in IS budgets. Revenues of this select group grew 8.8% to $1.53 trillion in 1987; profits were up 9.3% to $73.3 billion.

For 1988, DATAMATION projects revenues and profits will grow between 12% and 16% above 1987 figures. But we do not expect overall IS spending to increase as dramatically, owing to the continuing effort by corporations to control costs and improve margins. Still, in 1988, DATAMATION estimates the top 120 companies are spending $32 billion on IS.

Meanwhile, the percentage of revenues spent on information systems budgets in 1987 rose to an average of 1.9%, up from 1986's 1.8%. This translated into an aggregate IS budget of more than $29 billion at these 120 companies last year. Of this, $14 billion went to meet the salaries of IS personnel. Hardware expenditures accounted for the second-largest slice of the pie, totaling $10 billion. Overhead costs accounted for just over $2.5 billion, with software outlays also coming in at the $2.5 billion mark.

Three industry sectors—industrial and automotive, electronics, and banking and finance—dominated all others in the size of their corporate computer budgets. Together, these three accounted for $15.7 billion, or 54% of the aggregate IS budget of the industries we measured. Conversely, the health care and pharmaceuticals, metal and metal products, retail, and transportation sectors as a group consumed just 7.8% of the $29 billion aggregate budget. Still, the $2.3 billion these companies spent is far from inconsequential, and the importance of information systems to their corporate operations is generally greater than their IS budgets might indicate.

As impressive as are the IS budgets at these industry and commerce leaders, the reported figures fall far short of the actual monies spent at most of them companywide. In fact, some individual corporate IS budgets fell in 1987 as a result of decentralization activities. Growing numbers of firms are taking advantage of the power provided by desktop personal computers linked via local area networks to departmental minicomputers. While these, in turn, interface to the corporate mainframes, the departmental equipment may fall outside of the main IS budget.

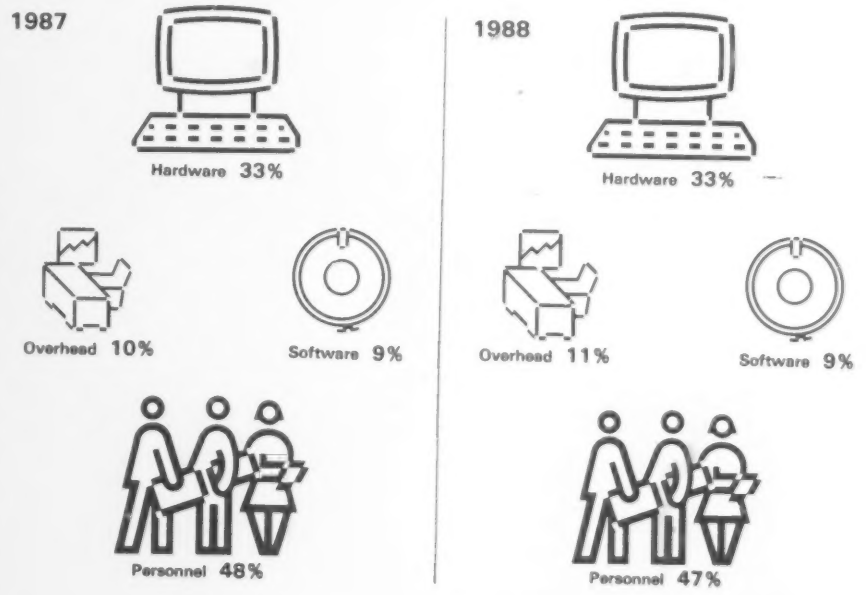
Industry by Industry Budget Summary

INDUSTRY	IS AS % OF REV	IS BUDGET	REVENUE	PROFIT
Banking & Finance	0.5*	$4,512	$902,486*	$(2,263)
Electronics	4.0	5,836	145,909	11,668
Food & Beverage	1.6	1,819	113,675	6,784
Health Care & Pharmaceuticals	1.1	576	52,248	5,004
Industrial & Automotive	2.7	7,748	286,950	12,804
Insurance	2.2	2,653	120,597	6,309
Metal & Metal Products	1.2	622	51,849	1,275
Petroleum & Petrochemicals	1.3	3,842	295,537	5,647
Process Industries	1.7	1,912	112,446	6,272
Retail	0.4	670	167,499	4,768
Transportation	1.3	757	58,210	2,762
Utilities	2.0	2,526	126,278	12,269
Totals	1.9**	33,473***	1,531,198**	73,299

*Assets, rather than revenues, are indicated in the Banking and Finance category.
**Based on revenue and budget totals from all industry sectors other than Banking and Finance.
***Includes the Banking and Finance expenditures.
All dollar amounts are in millions.
Source: Business Research Group

Distribution of IS Funds By Percent

Overall average for all industries



Photograph by Peter Mercier Magnum

Three industry sectors—industrial and automotive, electronics, and banking and finance—dominated all others in the size of their corporate computer budgets. Together, these three accounted for 54% of the aggregate IS budget.

In a similar fashion, much of the computer-based factory automation equipment and software comes under manufacturing operations budgets at companies that are in the business of producing products. In some instances, the amount spent on computer integrated manufacturing surpasses the computer expenditures for traditional corporate applications such as accounting, employee record-keeping, and payroll generation.

It is also at these top shops that advanced computer technologies first find commercial application. Due to their continued reliance upon in-house programmers to modify off-the-shelf software and to build custom programs, these big IS facilities are a prime market for everything from fourth generation computer languages to full-blown computer aided software engineering systems. The industrial and automotive sector, as well as the electronics industry itself, has an insatiable appetite for computer aided design equipment. And America's largest corporations are providing a solid test bed for expert systems.

In future years, hardware expenditures will continue to lead those for software, although the two will grow closer in value as more flexible off-the-shelf applications programs become available. As canned software expenditures continue to grow, and as computer systems become more modular and easier to operate, personnel costs will decline correspondingly. Meanwhile, the percentage of IS budgets directed at communications products and software is on the upsurge. Falling costs and growing capabilities both in local area networking and in wide area transmission facilites will stimulate strong investment in the communications realm.

IS Survey Methodology

DATAMATION and Business Research Group identified the top 10 companies in each of 12 predetermined industry sectors: Banking & Finance, Electronics, Food & Beverage, Health Care & Pharmaceuticals, Industrial & Automotive, Insurance, Metal & Metal Products, Petroleum & Petrochemicals, Process Industries, Retail, Transportation, and Utilities.

We based the selection on total revenues for 1987 obtained from annual reports and public records. To each company, we sent a letter introducing the DATAMATION Industry by Industry IS Spending Survey and the topics we wanted to discuss. We guaranteed each company individual anonymity to encourage respondents to provide information that some companies view as proprietary. We followed the letter with a telephone survey. At some companies' request, we mailed surveys. We again followed up the mailed survey with a phone survey to achieve the highest possible response rate.

The questionnaires contained two parts: a general section inquiring about the size of the dp/IS department, its responsibilities, its budgets, what the budgets cover, spending trends for 1987 to 1989, the size of the budget and its breakdown regarding hardware, software, personnel, and overhead. An industry-specific section then asked about that sector's average IS spending, where the company viewed its own position regarding its IS spending level, and how the company applied its computers to nonadministrative, production-oriented uses.

Terms are defined as follows:

Hardware comprises all computer gear on the IS budget including data communications. Software pertains to all funds allocated for buying software. Personnel encompasses all employee costs for computing operations and hiring software developers. Overhead includes charges associated with the physical plant, including utilities and rent. Production-oriented applications cover those nonadministrative IS jobs that affect the actual financial performance of the company.

Wherever possible, information included in this report was obtained directly from the companies. If a company did not provide information, or did not provide it in a suitable form, BRG estimated figures, based on investigative reporting and analysis of industry trends.

The comparative data are based on total budget IS expenditures and they do not include off-budget estimates.

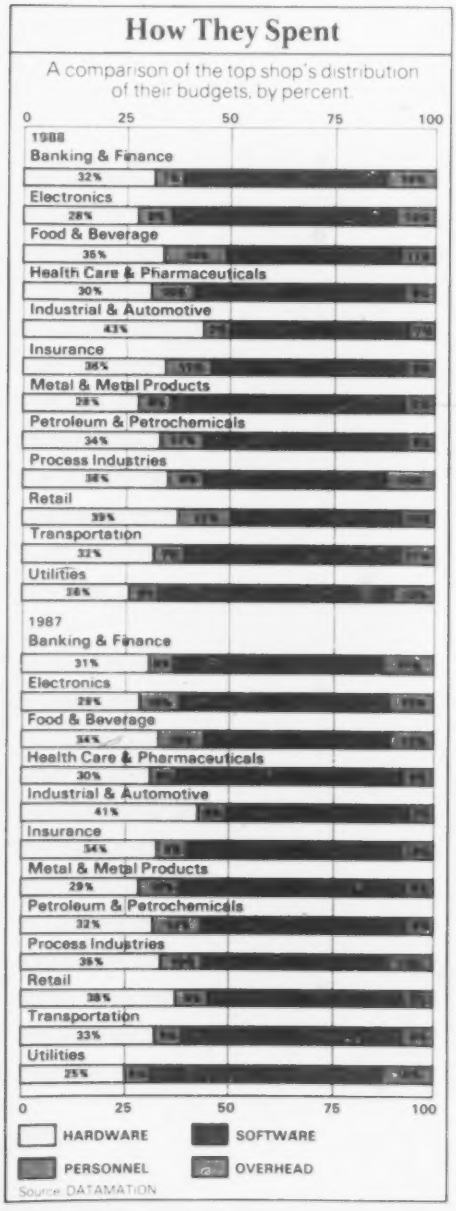
Every effort was made to include the most significant computer users in each of the 12 categories. Owing to the size of such a comprehensive survey as this, however, some large IS shops may have been omitted inadvertently from the listings. It should also be noted that, because the size of businesses operating within each sector varies to a great degree from industry to industry, some of the companies that failed to make our roster may in fact be larger users than companies in other sectors that did qualify for inclusion in our listings.

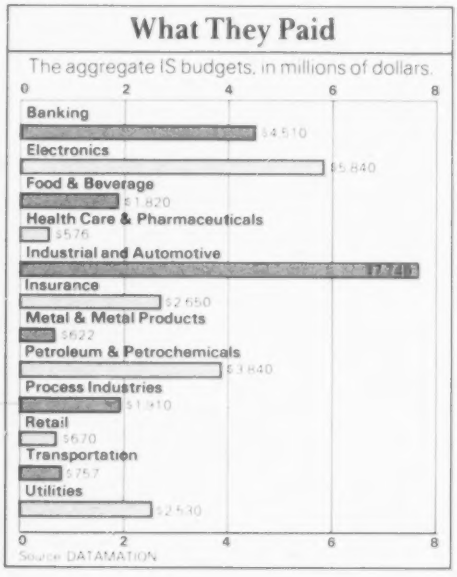
How to Read the Charts

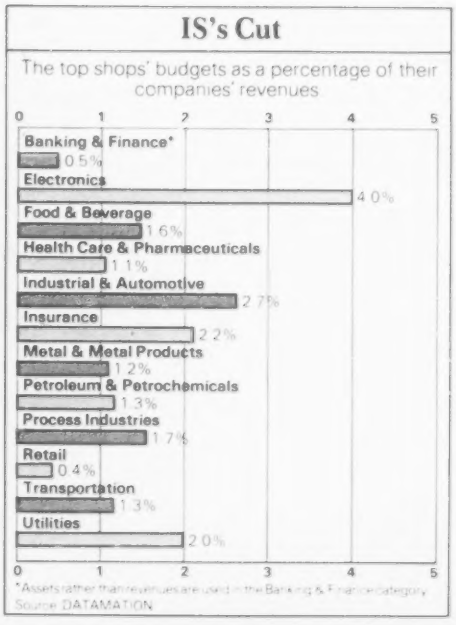
Data in the charts in this introduction reflect aggregate expenditures for the top 10 companies in each industry group.

The table for each sector shows the companies in each group, their computing intensity, their revenues, profits, and their accounting years. (For companies in banking and finance, assets rather than revenues are used.)

The computing intensity icon shows how each company in a group compares to others within that group. An equal sign (=) indicates that a company spends about the same percentage of its revenue on information systems as the mean for its group. A plus sign (+) means that a company spends a significantly larger proportion of its revenue on IS. A minus sign (–) means that a company spends a significantly smaller percentage of its revenue on IS.







Banking on The Best in IS

Even in tough times, the banks buy IS, running their back offices and competing for new customers with computer-based services. A big seller: fault tolerant systems.

Computer and communications systems constitute the backbone of the modern banking industry, and its leaders continue to surpass most other industry sectors in their aggregate expenditures in this area. Since revenue measures in this industry vary widely, the IS budget here has been calculated as a percentage of assets. The top 10 banks devoted 0.5% of their assets to IS in 1987, resulting in information systems expenditures of $4.5 billion on assets of $902 billion. Falling profits among several of the top 10 institutions last year have occasioned some belt-tightening. Giant Citicorp, for example, took losses of $1.1 billion in 1987, and BankAmerica, Manufacturers Hanover, and First Interstate Bancorp also finished the year heavily in the red.

Nevertheless, banks maintain and upgrade their IS facilities even during hard times. Increasingly, they compete for customers with new computer-based services tied to extensive networks of automatic teller machines. Banks are attempting to program the ATMs to be more responsive to individual customers. These services require custom programming, since off-the-shelf software gives no competitive advantage. In 1988, allocations for hardware and software rose relative to personnel and overhead spending.

The acquisition trend evident among the larger banking institutions is also placing growing demands upon IS personnel and equipment. Efficiently assimilating another bank's computer and communications operations into the parent company's puts a huge strain on the corporate IS department.

In their behind-the-scenes transaction processing, the financial institutions continue to focus on fault tolerant operations. With hundreds of millions of dollars on the line, banks and brokerages require extensive computer and networking duplication, precise error-checking routines, and robust systems software. As such, this

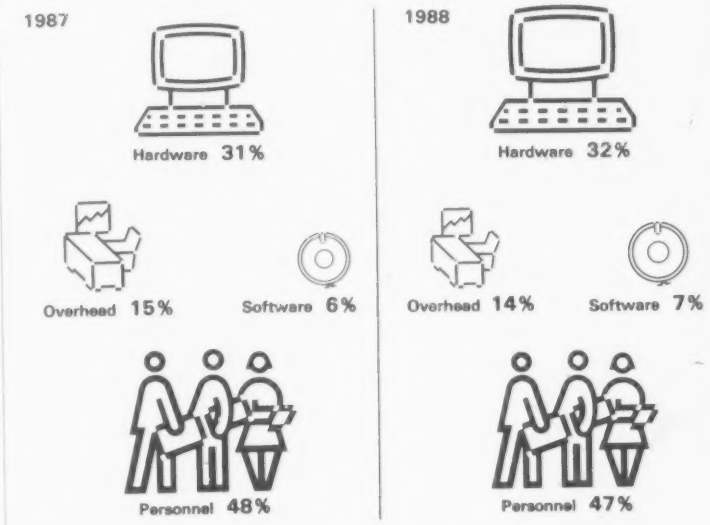
The Top 10

COMPANY	IS INTENSITY	ASSETS ($ MIL)	PROFIT ($ MIL)	FY END
Citicorp	+	203,607	(1,138)	12/31
American Express Co.	+	116,434	533	12/31
Federal Natl. Mortgage Assn.	–	103,459	376	12/31
BankAmerica Corp.	+	92,833	(955)	12/31
J.P. Morgan & Co. Inc.	–	75,414	83	12/31
Salomon Bros. Inc.	=	74,747	142	12/31
Manufacturers Hanover Corp.	=	73,348	(1,140)	12/31
Bankers Trust New York Corp.	=	56,521	1	12/31
Merrill Lynch & Co. Inc.	+	55,196	391	12/31
First Interstate Bancorp	=	50,927	(556)	12/31

*= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

Belt-tightening in response to falling profits has changed the picture at some big banks.



Source: DATAMATION

industry is more open than others to innovations in IS that ensure increased reliability as well as the more common goals of faster and more powerful functionality.

It is also in the banking and finance sector that frontier technologies often find their first commercial application. With the dispersed branches of banks and the widespread sales offices of the brokerage firms, this industry has been in the forefront of integrating advanced communications technologies such as satellite transmissions and fiber-optic networks into their operations. And, with their requirement of storing billions of bytes of archival information, the financial firms are major buyers of massive data storage systems such as laser videodisks.

This business also demands constant attention to the dynamics of customer interaction with the institutions, and some of the leading firms are exploring artificial intelligence to make these interactions more efficient. American Express has deployed one of the first major applications of an expert system with its "authorization assistant" program. The program applies the same rules as the firm's 300 authorizers to determine whether or not certain customer transactions should be allowed.

BANKING & FINANCE
CASE STUDY

IS Growth Checked

At Manny Hanny, IS spending has leveled off, but the big bank still sees automation as the key to reduced operating costs.

BY TOM McCUSKER

After seven years of breakneck investment in IS systems, Manufacturers Hanover Corp. has eased up a little this year. The $73 billion bank wants to make sure that its information systems have a direct relationship to its "effective and efficient" performance, explains Steven L. Sheinheit, senior vice president for strategic technology research.

"One of our goals is to get our investments in technology better aligned with the strategies of our various businesses," Sheinheit adds. These strategies can be tied to both growth and cost-reduction applications at the big money-center bank.

For example, Sheinheit thinks the bank's traditional businesses, which involve the handling of tremendous amounts of paper, require a reautomation of back office systems. Manufacturers now is looking at approaches to more efficient handling of paper, including the use of imaging systems.

Manufacturers Hanover is also applying technology to investment banking activity, which it expects to become a growing source of new revenues. For example, Manufacturers Hanover has installed an expert system, called Trading Advisor, to assist the people involved in making investment banking decisions. It will soon add other expert systems that are linked with the bank's networks of databases. Sheinheit sees other systems being added to replace investment banking's reliance on outside timesharing services and software packages.

The bank's 1988 investment in information systems of $382 million may be down slightly from last year because some elements in the bank's businesses aren't charged entirely to IS. For example, Sheinheit points out, many departments have personal computer operations where IS pays for some hardware, software, and consultants, but not for the staff. This represents about 10% of the IS spending budget. "Then there's another 5% to 10% that we can't find," he says.

Manufacturers spent heavily on information systems through most of the 1980s. IS spending was advancing at least 17% a year until 1987, when banks began reporting losses. But the slowdown in spending is probably temporary, and budgets are expected to rise during the next five years as technology solutions are applied to larger and larger bases within the bank. Sheinheit says people are coming around to realize that spending for automation often is the key not only to efficiency but to drastic reductions in operating costs.

Communications between the providers of IS technology and users are increasing all the time, says Sheinheit. The two groups set budgets together to establish planning processes for the implementation of high technology. The IS people provide management systems to measure factors such as product life cycles.

"Users now want improved negotiation procedures with IS," Sheinheit says. "They bring us what they want to have done and let us know what dollars they have. Then they ask us to prioritize these functions."

Photograph by Robert Llewellyn/Four By Five

Manufacturers Hanover is applying IS technology to investment banking activity.

Their Own Best Customer

Electronics companies are their own biggest fans: a whopping 4% of their annual revenues is budgeted for information systems. And, yes, they give themselves a discount.

Not the sort to slight their own products, the top 10 electronics companies lead all other industries in their IS expenditures as a percentage of revenues. The largest firms in this sector spent approximately $5.8 billion or 4% of their $145.9 billion 1987 revenues on in-house information systems. The figure would be even higher except that the computer manufacturers of the group can avoid paying list price on the major components of their systems. The percentage this industry sector spends on hardware and software will be slightly lower during 1988 than in 1987, which reflects some of the savings manufacturers realize on their own products. But they make up for this with increased spending on personnel. The aggregate amount spent will increase significantly this year as the electronics industry rebounds from its bleak years in the mid-1980s.

In many ways, the electronics companies mirror their counterparts in other industries in administrative computer usage. But the high-tech companies are trendsetters in IS operations extending well beyond ever-present payroll and personnel-type applications. Most notable are applications in the engineering and manufacturing sectors, their costs often falling outside the corporate IS budget. Complex microprocessor designs push CAD systems to their limits. In their manufacturing operations, electronics firms bank heavily on integrated manufacturing systems, which help meet both high output demands and precise design tolerances common to the industry.

In sales and marketing, the electronics industry leaders constantly look for new ways to exploit the potential of their own products. Detailed databases of customers' specific applications and operations, and computer-based catalogues of parts and optional design configurations help sales staffs and field support personnel deal with evolving hardware and software product lines.

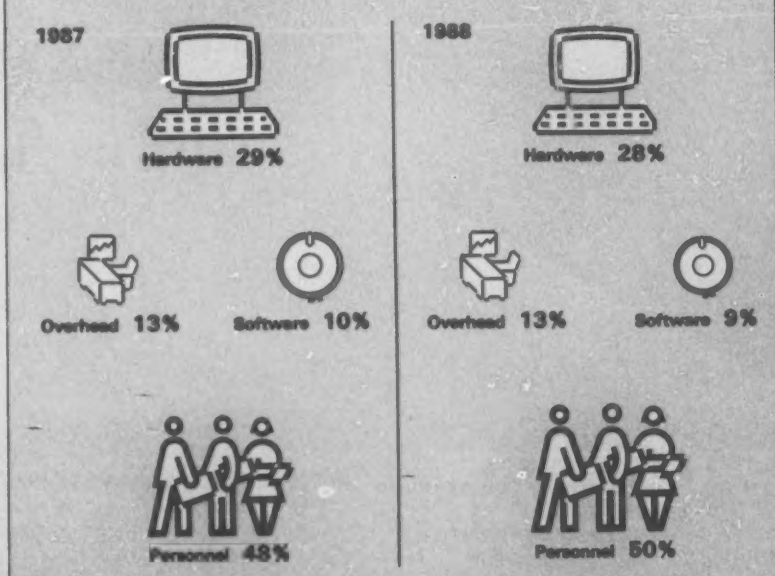
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
IBM	=	54,217	5,258	12/31
General Electric Co.	-	40,515	2,915	12/31
Digital Equipment Corp.	+	11,475	1,300	6/28
Xerox Corp.	+	10,550	578	12/31
Unisys Corp.	=	9,713	578	12/31
Hewlett-Packard Co.	=	8,090	644	10/31
Honeywell Inc.	-	6,679	253	12/31
Control Data Corp.	-	3,366	19	12/31
Intel Corp.	+	1,907	176	12/26
Square D Co.	=	1,484	99	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less.
Source: DATAMATION

Distribution of IS Funds by Percent

These are the heaviest IS users, and, were it not for discounts, hardware's share of spending would be higher.



Source: DATAMATION

The fast-paced nature of the electronics industry demands that the major players employ their own products in every stage of their business: product life cycles average only two to three years in some niches and the pressure to introduce new equipment and upgrade the old is intense. As these new products come on-line in the market, the electronics vendors are typically the first to incorporate them into their own operations. The companies often serve as their own test beds, hitting the IS budget for substantial personnel costs. Although the goal of the vendors is to provide a smooth transition path from their older products to newer ones, the reality of such constant in-house upgrading calls for high-salaried technicians, systems engineers, and applications programmers.

The electronics companies also lead in the use of office automation technologies, such as word, document, and image processing, electronic mail, voice store-and-foward systems, extensive networks of pcs and workstations, peripheral devices, and communications equipment. Like systems for design and engineering, much of this equipment is "off-budget" and is acquired by company divisions independent of the corporate IS budget.

ELECTRONICS
CASE STUDY

Success Stories at HP

Hewlett-Packard's goals are speedy response times and deep databases, all to keep customers coming back for more.

BY TOM McCUSKER

Hewlett-Packard Co. views its marketplace as fiercely competitive and increasingly global in scope. "Those who are fastest on their feet are the ones who will be most competitive and thus prosper," says Lloyd Taylor, director of corporate information systems at the huge Palo Alto electronics manufacturer.

This understanding of competitiveness is reflected by the company's information systems operation. For example, IS at HP has furnished its 3,000-person U.S. sales force with laptop computers and access to databases—among them, some still under construction—that provide data enabling salespeople to offer faster response to customers. The databases provide qualified sales leads and will give sales staffers access to such helpful information on these prospects as historical data about their purchase needs over long periods of time. By the time all of the databases are completed, salespeople from all over the world will be communicating on HP's X.25 protocol network.

Already widely known for its implementation of computer integrated manufacturing systems, the company is brimming with success stories that show product improvement resulting from these implementations. While the use of computers for factory floor automation, engineering design, or anything else directly related to the product development process does not fall under the IS function, IS nevertheless provides the information flow in these applications.

For example, Taylor points to what he calls "an integrated flow of information" between product design groups and manufacturing, a flow that reduces product cycle times. Among the products of this information flow is improved manufacturability of products, and the ability to design fewer and more specific parts—important characteristics in such processes as flexible and just-in-time manufacturing.

Still another development that Taylor says will aid the company in responding to customers is an expert system that will configure computer systems. He admits the concept isn't new. Digital Equipment Corp. has been configuring computers with its own expert system since the early 1980s. But Taylor said the system, due to become operational in mid-1989, will be valuable to Hewlett-Packard in shaving both time and required parts from its customer proposals.

Each of the company's business units determines what it should spend on hardware and software, while corporate IS consults with these divisons to integrate the information flow and supply of productivity tools and communications services. Spending for IS in recent years has grown in direct proportion to total revenue growth—about 14%. HP's 1988 IS spending will reach $320 million, rising to $365 next year, with similar growth rates continuing well into the 1990s, Taylor predicts. As a percentage of HP revenue, IS spending remains at about 3.5%.

At Hewlett-Packard, spending for IS has grown in direct proportion to revenue growth.

Photograph by Scott Barrow/Four By Five

Steady IS Consumption

Low-margin, high-volume businesses spend a lot on tracking products, but Coke's computer-resident spokesman, Max Headroom, is an off-budget item.

The percentage of revenues spent on information systems by the major food and beverage companies held steady at 1.6% from 1986 to 1987. Revenues at the top 10 of these firms rose 9% to $113.7 billion during that period, bringing the total IS expenditures to $1.8 billion last year. As in the past, these companies tend to be conventional users of computers, with the bulk of their applications tied to corporate accounting and record-keeping tasks. Like their counterparts in the automotive and financial industries, the major food and beverage firms cut their overhead and personnel costs during 1988, while spending more on hardware and software.

With their businesses centered around high-volume, low-margin products, much of the computer power expended at the food and beverage firms is spent on coordinating production and shipment of products with fluctuating demand from distributors and retailers. This necessitates sophisticated production control and inventory systems as well as applications software that tracks and projects demand and profiles markets. These companies are also big users of billing and order entry systems, although they can often rely upon standard software packages to handle these jobs.

Food and beverage suppliers have also increased their reliance upon computer control in their factories. Beverage companies in particular share many production traits with the process industry, and benefit from the exact timing of manufacturing steps and the precise mixing amd movement of ingredients that factory automation permits.

The proportion of information systems expenses devoted to marketing and sales functions at these companies is also increasing. Marketing applications have become especially critical in situations such as the taste-test war between Coca-Cola

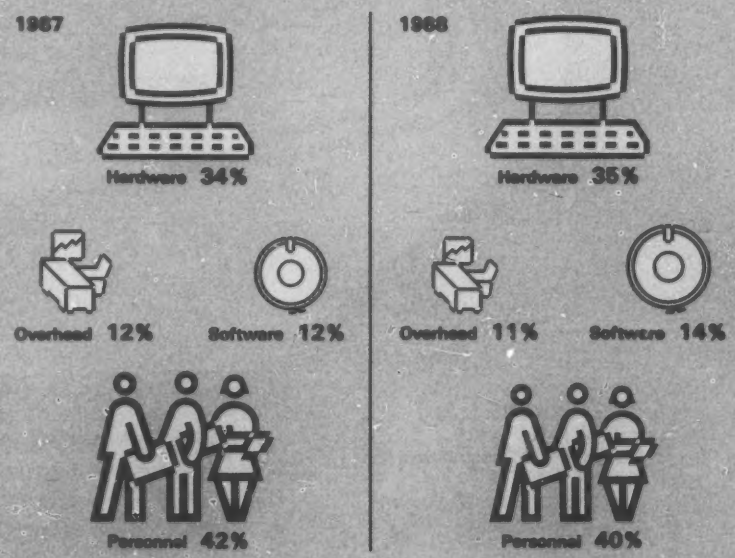
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Philip Morris Cos. Inc.	+	27,695	1,842	12/31
RJR Nabisco Inc.	=	15,766	1,209	12/31
PepsiCo Inc.	=	11,485	594	12/28
Kraft Inc.	=	9,876	489	12/21
Sara Lee Corp.	=	9,155	267	6/30
American Brands Inc.	=	9,152	522	12/31
ConAgra Inc.	=	9,002	149	5/25
Anheuser-Busch Cos. Inc.	+	8,258	614	12/31
Coca-Cola Co.	+	7,658	916	12/31
Pillsbury Co.	-	6,128	182	5/31

= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Major food and beverage companies cut overhead and personnel costs and spent more on hardware and software.



Source: DATAMATION

and PepsiCo Supporting sales personnel with up-to-date information on special offers, product availability, and market figures has become imperative at the leading vendors. More and more, these data are distributed to regional and district representatives via terrestrial and satellite networks. Likewise, customer orders and other local information can be uploaded to corporate headquarters over the same communications routes.

Compared with other industry sectors, the food and beverage companies continue to spend lower percentages of their IS budgets on personnel. This cost is slowly increasing, however, as the leading companies branch into areas that can't be adequately addressed by canned software. Still, this industry continues to be characterized by a high rate of mergers and acquisitions, and the incentive to reduce the pain of integrating acquired computer operations with those existing at the parent company remains strong. As such, these companies will try to maintain standard software and systems for traditional corporate computing tasks, while building custom applications in more independent operations such as factory automation and sales support.

FOOD & BEVERAGE
CASE STUDY

Aiming to Save Dough

Pillsbury is fighting a takeover bid while it builds an integrated IS structure for its troubled Burger King operation.

BY TOM McCUSKER

In the fiercely competitive and merger-manic food and beverage industry, spending plans that have any relation to company strategy are considered secret.

This is even more pronounced when it concerns information systems at Pillsbury Co., Minneapolis, which this fall was in the midst of a bitter battle against a hostile takeover. Its information systems director, John Hammitt, had abruptly left the company for United Technologies in Hartford, Conn. His successor, Carl Wilson, said that for the time being any kind of data on Pillsbury's information systems operations was "company confidential."

IS has a crucial role in the huge $6 billion company's strategy, however. For example, sources report that Pillsbury is in the midst of developing an integrated information program for its troubled Burger King Corp. fast food chain. The goal is to improve the 5,680-unit chain's poor performance by integrating all functions—including point-of-sale activity—and by tracking inventory needs in an on-line fashion.

Pillsbury is developing an integrated information program for its Burger King Corp.

Photograph by David Hiser/The Image Bank

Among Pillsbury's other strategic information systems efforts is the use of technology to improve its position as a low-cost supplier to customers, for example by making wider use of electronic data interchange for receiving orders, invoicing, and being paid.

Information officers in each of its five business units determine the technology to be used, and the dollars to be spent, to achieve Pillsbury's strategic goals. Until this year, what they said they needed was generally being heeded by top management: Pillsbury's 1988 IS budget of around $120 million is about 10% ahead of the prior year. According to some sources, this increase was achieved despite pressure to reduce spending throughout the company.

Spending in the future is in doubt, following a $5.23 billion takeover bid made last month by Grand Metropolitan PLC, a British conglomerate that has been restructuring itself as a global liquor, food, and retailing organization.

Pillsbury has been under pressure to sell off some of its restaurant group, but consistently has refused. And while there has been much talk before of a Pillsbury takeover, potential bidders have shied from having to swallow the Burger King operation. But not Grand Metropolitan, which has plans to extend the chain's operations overseas. Only 10% of Burger King's stores are overseas, compared with 25% for archrival McDonald's Corp., giving Grand Metropolitan plenty of room in which to grow.

Prescription For Success

Personnel's bite of the health and pharmaceuticals IS dollar is the largest of any industrial sector. The villain may be a dearth of packaged software that fits the prescription.

While IS spending at health care and pharmaceutical firms is increasing, the industry lags all but the retail sector in the percentage of revenues it devotes to information systems expenditures. (The percentage for Banking & Finance is figured on assets.) Still, the percentage of revenues spent in 1987 rose to 1.1%, up from 0.6% in 1986. This translated into an aggregate IS budget of $576 million at the top 10 companies. Despite its relatively low IS expenditures, this industry remains one of the most dependent upon computer and communications facilities. Moreover, personnel costs remain the highest, relatively, of all industry sectors, reflecting an inability to meet computing needs with standard software packages. Despite this dependence on personnel, 1988 budgets show a decrease in personnel spending and an increased investment in the software to run the computers that control many of the production and laboratory processes.

Clear differences exist between the pharmaceutical and the health care companies in this sector. The former, with their heavy emphasis on research, have considerable off-budget expenses in laboratory computer systems. In recent years, the research arms of the drug manufacturers have looked to the horsepower of supercomputers and minisupercomputers for assistance in everything from calculation of complex formulas to the modeling of a drug's molecular structure. In addition, the pharmaceutical firms now rely upon the precision of computer controls for their drug production lines.

Once drugs are in clinical trials, computer systems track patients' conditions and lab results. Since these trials can last from months to years, programs must be devised that can identify and track statistically significant variations in patient symptoms over time. As an industry under close government scrutiny and regulation, the pharmaceutical firms call upon

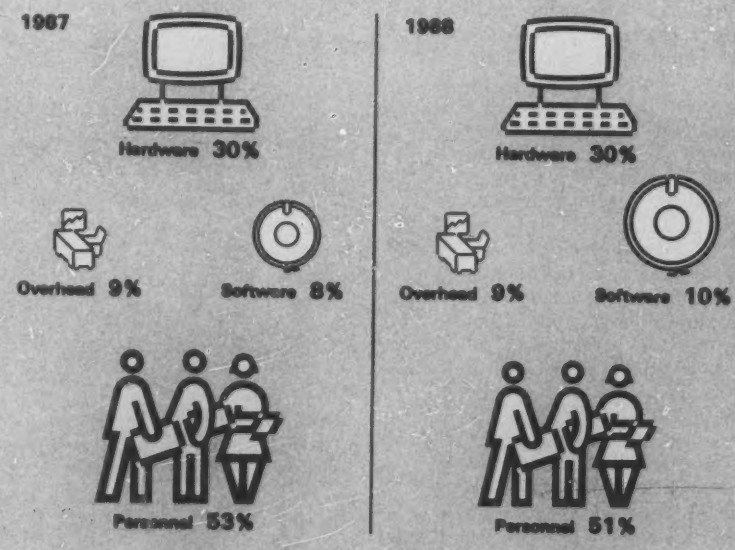
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Johnson & Johnson	+	8,012	833	12/31
McKesson Corp.	=	6,671	231	3/31
Baxter Travenol Labs Inc.	=	6,223	692	12/31
Bristol-Myers Co.	=	5,401	709	12/31
Merck & Co. Inc.	=	5,061	906	12/31
American Home Prod. Corp.	+	5,028	945	12/31
Pfizer Inc.	+	4,919	690	12/31
Hospital Corp. of America	-	4,676	(58)	12/31
Bergen Brunswig Corp.	+	3,376	16	12/31
Intl. Medical Enterprises Inc.	-	2,881	140	5/31

= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

Personnel's big chunk of the IS dollar in this industry is coming under increasing control.



Source: DATAMATION

computers to help process the mountain of required forms and documents.

For health care providers, patient record-keeping represents a major application, one where standard database management systems often suffice. A key consideration here, though, is system security, with providers restricting access to these records to authorized personnel. Meanwhile, lab testing and analysis are dependent upon computer control, as are the sophisticated monitoring machines employed with critically ill patients. Although advanced diagnostic tools such as computer aided tomography and nuclear magnetic resonance fall outside of the corporate IS budgets of these firms, they nevertheless represent a considerable computational expense.

The importance of rapid integration of patient information from different departments of health care facilities has caused many to invest in local area networks. By linking labs and X-ray rooms to nursing stations and administrative offices, the facilities realize savings in operational costs while improving the efficiency and quality of their health care.

Billing remains one of the most demanding of applications for the health care providers. Unlike bills for straightforward transactions where customers buy a single product or service, hospital bills can contain tens of categories covering prescription costs, laboratory fees, and consultation expenses in addition to basic room and care rates. And, like the pharmaceutical firms, the health care providers have more than their share of government regulations to meet, which they do largely with the assistance of their IS departments.

HEALTH CARE
CASE STUDY

IS Drives Distribution

McKesson gears IS toward two goals: providing more services to customers and operating with Spartan efficiency.

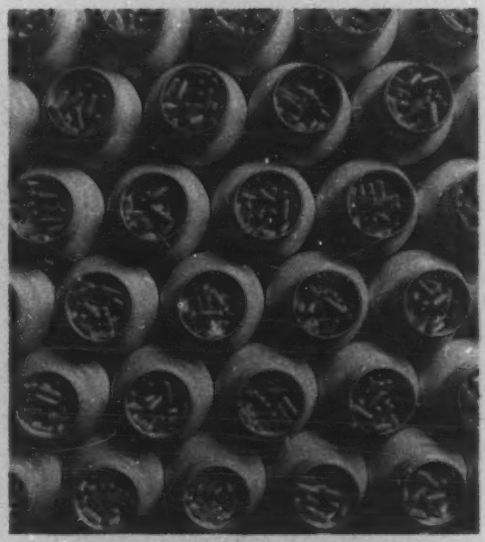
BY TOM McCUSKER

McKesson Corp. of San Francisco is the largest drug distributor in the U.S., with 50 distribution centers throughout the country and annual sales of more than $6.6 billion.

It operates on tight margins of under 10%—margins that are always under pressure, says Jon d'Alessio, vice president of operations planning and information technologies. D'Alessio adds that McKesson's 25,000 customers, chiefly pharmacies, store chains, and hospitals, have a seemingly insatiable appetite for services from the company. Therefore, it is no surprise that McKesson has been gearing its information systems activity toward two goals: providing more services to customers and operating with Spartan efficiency. The key to success, says d'Alessio, is a 15-year-old electronic distribution system, called Economost, that is continually being refined and expanded. This year, nearly all of McKesson's customers have been hooked to the system, which automatically takes orders from the customers, processes them at a data center in Sacramento, Calif., and dispatches the orders to its 50 warehouses.

The system even provides retail price stickers for individual products according to customers' targeted markups. A box of 12 toothpaste tubes, for example, will be sent to a customer along with 12 price stickers printed with the amount predetermined by the specific store.

Last May, McKesson installed a satellite network to transmit data between the Sacramento data center and the warehouses. The system became operational a few days before a fire crippled an AT&T network transmission station in Chicago. "Our competitors couldn't get their orders out to their warehouses," chuckles d'Alessio, "while we were running smoothly." D'Alessio says it is a top priority to continue to make Economost more flexible and easier to use by customers. "It gives us the competitive edge," he asserts.



McKesson will spend about $85 million for IS in 1988.

To prepare the company's annual spending plans, its five business units first draw up lists of priorities. "They look at what they're spending this year and how we're making out on backlogs of software development. Then we agree that we can only slug it out three years at a time." Throughout the process, however, users and their IS people, working closely together, set the agenda.

This year, McKesson will spend about $85 million for IS and about 10% more in 1989. Down the road, d'Alessio thinks spending will rise at a slower rate because of the operating leverage current that IS systems have given the company.

Unattended operations is one of the company's goals, particularly at its Sacramento data center, which is already getting by with fewer and fewer people every year. "More and more," d'Alessio observes "we're beginning to call it the 'morgue,' it's so quiet." He thinks his warehouses, which use IBM System/36 systems, might be candidates for unattended operation if McKesson moves to the IBM AS/400 successor computers.

"We're not in a hurry, though," d'Alessio concludes. "We need these systems to work, and it's good to know there are people around in case anything goes wrong and half the corporation would be down. You can't take orders by hand."

Photograph by Charles Orrico/Four By Five

Driven To Compute

They are the big spenders in the survey. Industrial and automotive companies have the biggest aggregate revenues and devote an above-average hunk to IS.

The industrial and automotive top 10 continue to dominate the IS user marketplace, thanks to the coupling of impressive revenues with an intensive use of computers and communications in all aspects of their business. Only the petroleum and petrochemicals leaders' revenues surpassed the $286 billion realized by this sector in 1987, and the oil industry spends just 1.3% of its revenues on IS compared with industrial and automotive's 2.7%. This 2.7% translates into an aggregate IS budget of $7.75 billion for the top 10 last year. During 1988, there has been a shift in the allocation of IS funds. Hardware spending will increase slightly, draining capital resources previously spent on software and personnel.

The carmakers and plane manufacturers represent the largest commercial users of high-cost supercomputers. Despite the multimillion-dollar expense of acquiring and operating these number crunchers, these firms have been able to justify the cost by modeling and testing new designs on the computers rather than through the time-consuming and error-prone production of actual scale models. Processing tens to hundreds of millions of instructions each second, the supercomputers perform simulated crash testing of cars, analyze stress points of parts under extreme conditions, and model the fluid flow of air over a plane's wings. Wind tunnels aren't obsolete yet, but they're becoming increasingly secondary to the mathematical proof.

Moving design to production is becoming more and more automated at the auto manufacturers, with CAD equipment linked to factory-floor equipment. Digital output from the CAD systems is fed directly into numerically controlled production machinery; assembly-line robots piece together discrete components, weld frames, and paint auto bodies; vision systems search for flaws in parts. Coordinating

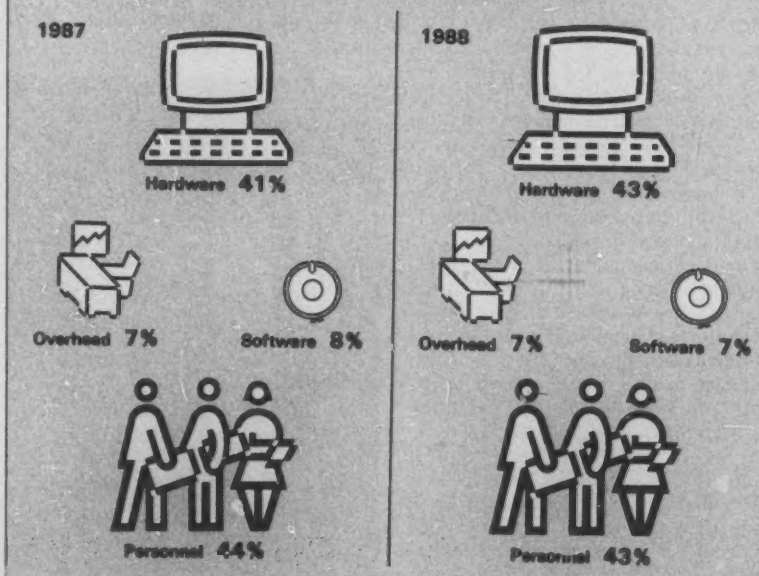
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
General Motors Corp.	+	101,781	3,550	12/31
Ford Motor Co.	-	62,716	4,625	12/31
Chrysler Corp.	-	26,276	1,289	12/31
United Technologies Corp.	+	17,170	592	12/31
Boeing Co.	+	15,355	480	12/31
McDonnell Douglas Corp.	=	13,344	313	12/31
Rockwell Intl. Corp.	=	12,123	635	9/30
Lockheed Corp.	=	11,321	421	12/31
Allied-Signal Inc.	-	11,116	656	9/30
TRW Inc.	=	6,821	243	12/31

"=" means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less.
Source: DATAMATION

Distribution of IS Funds by Percent

In 1988, hardware spending increased slightly, draining capital resources previously spent on software and personnel.



Source: DATAMATION

these processes are superminicomputers linked to high-speed local area networks, some of which use fiber-optic technology both for its transmission volume capacity and its immunity to factory-floor electrical noise. General Motor's MAP communications protocols continue to advance the cause of networking standards in such environments.

All of the top 10 companies in this sector are dependent to one degree or another on defense industry contracts, and their in-house computer facilities play an important role in everything from preparing bids to developing prototypes to documenting products. Companies in this business are among the major users of internal electronic publishing systems. In the documentation process—which, for complex pieces of equipment such as fighter planes, can entail the generation of thousands of pages of text and illustrations—the publishing systems are becoming indispensable. They maintain audit trails of revisions and corrections by date and by author, merge text from standard word processing systems with CAD generated illustrations, and interface to high-quality output devices such as typesetters and laser printers.

IS departments within these firms have also become critical in the maintenance of parts inventories, the scheduling of production lines, and the sales and marketing of products. Considering the importance of such a broad range of applications, it's easy to overlook the fact that the industrial and automotive firms have equally impressive IS facilities to deal with such mundane tasks as maintaining records on their vast employee populations and meeting payrolls.

INDUSTRIAL & AUTO
CASE STUDY

A Strategy per Customer

Rockwell's IS organization spreads through its 50 businesses: only a third of its IS budget is spent at headquarters.

BY TOM McCUSKER

Rockwell International Corp. runs a highly decentralized information systems organization that mirrors the company's organization as a collection of nearly 50 divisions in the automotive, printing press, electronics, and aerospace businesses. Overall revenues total more than $12 billion.

Each division has its own IS activity and its own strategies, often tied to the strategies of its customers. For example, Rockwell's automotive companies have systems that are designed to deal with Ford and Chrysler's very different proprietary systems, explains J. David Mitchell, vice president of strategic planning and CIM development at Rockwell's IS headquarters in Seal Beach, Calif.

The budgeting process also follows the company's decentralized structure. IS spending at the divisions is determined through normal budgeting processes—working within divisionwide business and capital plans—and the strategies are approved by senior management. Mitchell says that many divisions have standardized their use of personal computers, limiting the number of vendors and requiring that a minimum number of software packages be included with each personal computer.

Despite the decentralization, Rockwell companies can access the company's huge regional business and scientific data centers in Seal Beach and Dallas. The centers handle financial services, payroll, manufacturing resource planning systems, and engineering data systems: "Anything the companies feel they'd like to have done outside," Mitchell explains.

Mitchell adds that Rockwell's strategy is for its subsidiaries to take increasing control of their IS activities. For example, almost 36% of the $433 million to be spent on IS at Rockwell this year will represent the corporate IS activity, which includes the two regional centers. Five years out, the spending level will rise to $525 million, but headquarters will represent only 34% of the total, Mitchell says.

Each Rockwell division has its own IS plan.

To arrive at these spending totals, information systems executives in the various businesses have built up a set of data to break out total IS spending. "The real IS component is being defined very precisely by IS organizations, and the process has been maturing each year," Mitchell adds. "They know what is going on."

Keeping information systems staffs aware of new technology is accomplished by what Mitchell calls technical councils and technical task groups, sponsored by corporate IS. These councils and groups are part of a process designed to encourage the sharing of technology among the companies, "to prevent reinventing of wheels."

Mitchell says the company has been looking at computer aided software engineering (CASE) tools to enable more effective programming of software contained in products made by Rockwell. Rockwell's businesses make wide use of expert systems, many of them embedded within products. Rockwell's printing presses have expert systems embedded within their controls, as do the avionics in the cockpits of aircraft. Many of Rockwell's systems products are configured for customers through the use of expert systems, but as yet the company doesn't see these expert systems as solutions in the engineering and factory products it sells.

As for the headquarters IS role in new applications, Mitchell says, "We bring people and ideas together to share our knowledge and to probe theirs. We act as a catalyst."

Photograph by Al Satterwhite/The Image Bank

Premium IS Policies Pay Off

In a good year for the insurance business, the big spenders got control of personnel costs. Hardware and software took a bigger share in an IS-intensive industry.

The leading insurance companies had a good 1987. Revenues jumped 20.5% to $120.5 billion. Of this, a healthy 2.2% was devoted to corporate information systems, resulting in an aggregate budget of $2.65 billion. This amount put the top 10 insurers on a par with the IS expenditures at their counterparts in the utilities industry, and in the top half of the 12 industries surveyed. The insurance companies are near the industry average in the way they apportioned their budget among the four categories of hardware, software, personnel, and overhead. Like many of their industrial counterparts, 1988 insurance company budgets reflect savings on personnel and overhead with commensurate increases in hardware and software spending.

Unlike sectors such as the industrial and automotive, process, and electronics industries, the insurance business has no inherent computer expenses in the manufacturing and production realm, although firms such as ITT do have divisions that are industrial in nature. Insurers make up for this lack of IS breadth by being among the most highly automated office and administrative users of computers. Virtually every desk at corporate headquarters as well as at agency offices is adorned with a personal computer or terminal, and these are linked by both local and wide area communications networks.

Mainframe computers at headquarters facilities perform prodigious processing of client policies, records, and claims. As such, the insurance industry has always been a leader in the testing and employment of database management techniques and software. The top insurers are among the major users of specialized hardware such as database management machines and image processing systems.

In the face of growing claims litigation costs as well as tight government regulations—both at the state and federal levels—the insurers are turning to their IS

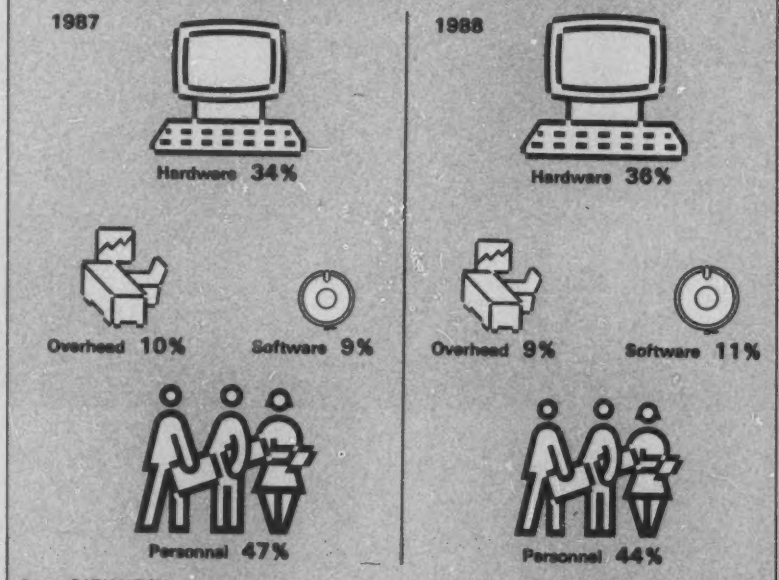
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFITS ($ MIL)	FY END
Aetna Life & Casualty Co.	+	22,114	921	12/31
ITT Corp.	+	19,524	1,018	12/31
Travelers Corp.	=	17,500	428	12/31
Cigna Corp.	=	16,909	728	12/31
American Intl. Group Inc.	=	11,728	945	12/31
Loews Corp.	=	9,323	696	12/31
Transamerica Insurance Co.	=	7,175	427	12/31
American General Corp.	=	7,157	565	12/31
Continental Corp.	=	5,801	234	12/31
St. Paul Cos. Inc.	=	3,366	357	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Insurance companies are near the overall average in apportioning their budget among hardware, software, personnel, and overhead.



Source: DATAMATION

departments for risk management and decision support applications. Such software is increasingly available off the shelf, and companies in this sector have become prime candidates to acquire it. Rate setting has become an intricate science of balancing the cost of claims with various risk factors and operating expenses, and in-house applications programmers constantly tweak and modify the systems.

Insurers have long been active in profiling their customer bases to arrive at risk assessments. Computers deliver the power to accurately compare driving records across different population groups, to calculate the risks of insuring homes and automobiles in particular neighborhoods, and to establish life-expectancy tables.

The insurers' information systems departments are also being called upon to assist in the marketing of policies, especially to corporate clients. Electronic publishing systems tied into computer graphics packages are used by the insurance vendors to prepare slick company-specific presentations to sway potential customers. Corporate computers churn out analyses of new market opportunities and they direct attention to sectors that have begun to slip. In a business built on risk, the IS operations in the insurance industry serve to reduce the gambles undertaken by the insurers themselves.

INSURANCE
CASE STUDY

Insuring Good Decisions

Transamerica's IS operation builds decision support and provides instant access to the profit picture.

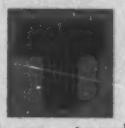
BY TOM McCUSKER

Information systems are enabling large organizations like Transamerica Corp. of San Francisco to cope quickly and efficiently with outside pressures that would have bewildered executives only a few years ago. Senior executives in these companies are using computers directly in their decision-making functions.

"Decision support systems on pcs have an increasing role in the way these executives conduct their jobs," observes Pete Dawson, vice president of information systems at Transamerica. "They are not afraid to develop models or their own databases to keep track of things that are critical to the businesses they manage."

At Transamerica, as at countless other companies, IS systems go well beyond the pc to help management in developing strategies more rapidly to meet shifts in business conditions, i.e., they address such factors as interest rate changes (the place where insurance companies are vulnerable); pricing fluctuations in the casualty insurance business; changes affecting world trade in the container leasing business; and, more recently, changes resulting from tax reform. Dawson notes, for example, that IS provides profit information almost immediately and has computer programs that aid in better utilization of the container fleet. "They help management to react to these changes in a more competitive way," he adds.

As these systems proliferate, Transamerica is making an effort to better account for the IS content in its various businesses, Dawson says. For example, this year the company will spend $160 million for information systems, including hardware, and next year that figure will increase by 8% or 9%. "But part of the increase will be due to better accounting," explains Dawson. For example, pcs often are buried in other budgets, and nondedicated voice and data networks are not identified as IS. Typewriters and word processors are considered to be administrative costs until they're replaced by pcs. So are communications services, which were considered to be non-IS until they began carrying electronic mail.



Dawson says that tighter accounting procedures influence the decision-making process in setting up spending plans at the company. New expenditures as well as better detection of IS content will send the company's IS spending level up 16%, to $190 million, by 1992.

Directly involved in approving budget requests, ceos of Transamerica business units exhibit increasing appreciation for the IS function. Nearly all IS officers report to ceos today, says Dawson, a trend that has evolved as IS "outgrew financial areas of the business and began moving into operating areas."

The company is examining ways to reduce its software development costs and waits expectantly for computer aided software engineering tools to mature. So far, it has not implemented CASE tools except on a trial basis. Other technologies, such as AI and accompanying expert systems, are "more than we could possibly implement," says Dawson.

Transamerica's IS systems help management in meeting rapidly shifts in business conditions.

Photograph by Bill Longcore/Photo Researchers

Mining the Data Lode

Rushing to diversify, the metal industry integrated new businesses at a furious clip. Result: the percentage this sector spends on IS personnel is the survey's highest.

Historically, companies in the metal and metal products sector lag other industries in IS expenditures. Last year was no different. The top 10 metal firms fell into the bottom quarter of the 12 industries surveyed, spending just 1.2% of their revenues on corporate information systems. Still, this percentage represented a small rise from the previous year's, and revenues themselves were up a healthy 15% over those in 1986, reaching $51.8 billion. The aggregate profit picture at the big 10 also improved from 1986 to 1987, moving from a loss of $1.6 billion to a gain of $1.3 billion. As this gradual growth continues, it will be reflected in the total IS budget for the top 10 metal companies, which in 1987 stood at $622 million.

The leaders in this industry also lead in diversification activity, as they try to shore up the weakened walls of their core business. As the metal firms bring new subsidiaries under their wings, the corporate IS departments strain to integrate the diverse operations into their bookkeeping and personnel applications. This demand is adding to personnel costs, with the IS departments adding applications programmers, systems engineers, and data entry staff to their rosters. In 1987, the metal and metal products sector equaled the health care and pharmaceuticals industry in the percentage of IS funds devoted to personnel. Only the utilities companies devoted more of each IS dollar to personnel. This year, the metal companies caught up and will spend a higher percentage on personnel than any other sector. Figures for 1988 also show these companies spending proportionally more this year on personnel and overhead than they did last year.

Despite diversification, the metal producers haven't abandoned their mainstay businesses. Most are beefing up the process control and factory automation aspects of their mills in an attempt to

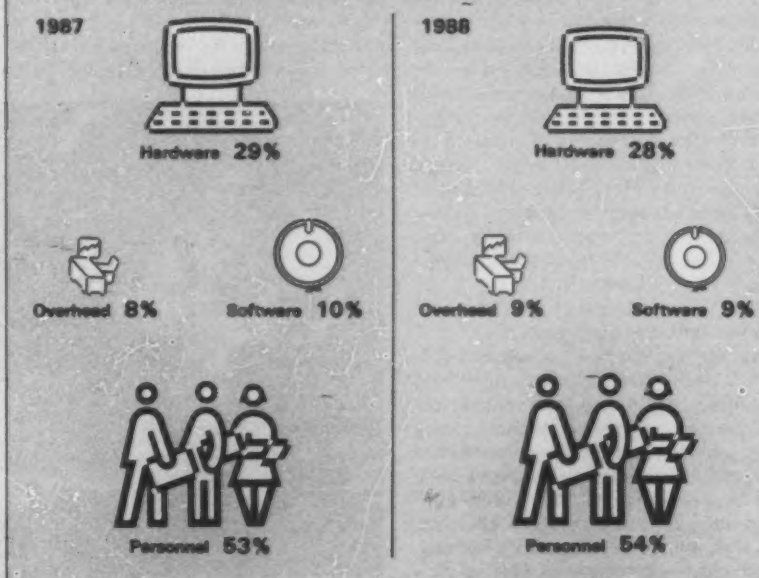
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
USX Corp.	+	14,836	219	12/31
Aluminum Co. of America	=	7,767	200	12/31
LTV Corp.	=	7,582	502	12/31
Bethlehem Steel Corp.	=	4,620	174	12/31
Reynolds Metals Co.	+	4,316	219	12/31
Inland Steel Industries Inc.	=	3,453	145	12/31
AMAX Inc.	-	3,383	61	12/31
Armco Inc.	=	2,927	117	12/31
Kaiser Aluminum & Chemical Corp.	=	2,085	(362)	12/31
Commercial Metals Co.	-	880	10	12/31

= means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

The top metals firms fell into the bottom quarter of the 12 industries surveyed, spending just 1.2% of their revenues on IS.



Source: DATAMATION

improve efficiency and bolster their competitive stance. Much as have the process industries—a group with which they share many traits—the metal producers are turning to computer integrated manufacturing techniques to monitor and control the volatile production processes. Precise control helps ensure metal consistencies as well as reducing product impurities, and the close monitoring of the operations improves overall manufacturing safety. Expenditures in this realm generally fall outside corporate IS budgets, but they are substantial both in dollar value and in strategic importance to these firms.

Although relatively small compared with the general administrative and factory automation applications, the area of testing and developing new products is a critical one at several of these firms. Here, computer resources are applied to generating new formulas for metal mixtures as well as to developing faster and higher-yield manufacturing processes.

Just as computers are playing a growing role in getting better metal products quickly out the factory door, so they are increasingly called upon to manage the ordering and supply of the products to a worldwide customer base. These customers are much more concerned with the quality and availability of the product than with its company or country of origin, and the producers that can meet customer demands for volume shipments on short order gain a tremendous competitive advantage. As part of responding quickly to orders, metal companies monitor and supervise the status of their shipments around the world. Again like the oil producers, the metal firms have a strong vested interest in delivering their commodity efficiently, and they expend considerable computer resources ensuring that their supply networks function smoothly.

METAL & METAL PRODUCTS
CASE STUDY

IS Has Nerves of Steel

At big steel's Armco Inc., IS helped make the difference between near bankruptcy and profitability.

BY TOM McCUSKER

Information systems have played a vital role in the return to profitability of Armco Inc., the Middleton, Ohio, steel company that four years ago was a month away from declaring bankruptcy. "We've lost $3 billion," says William Monteith, Armco corporate director of information resources management.

But in the last two years, Armco has been reporting profits again after a restructuring and divestment program that in three years has taken the company from a $7 billion a year organization to one making $3 billion a year. Along the way, it has been making "very extensive" investments in the manufacturing arena. Monteith won't disclose exact figures, but he indicates that "every single president of our customer companies declares that information is a desperate need in his company's future." He adds that at some customer installations 50% of capital investment is in information systems, and it "shows signs of going higher."

Although it has not yet adopted full-blown, ore-to-steel computer integrated manufacturing, Armco has installed computer-based integrated manufacturing programs to improve productivity and quality. It has adopted just-in-time philosophies and concepts and methods to automate manufacturing resource planning. "We go into these programs promising productivity improvements of from 20% to 50%," says Monteith, "and improvements in yields of 10% to 15%. In a recent installation, a 12% increase in yields was observed within a month."

Monteith thinks the company's biggest improvement could be produced by the application of artificial intelligence to complex problems. He says "six or eight" expert systems projects are under way. Most are secret, but Monteith says a project to simplify the way Armco's steel products are ordered should yield the largest payoff. Because of the complicated ways that Armco steel products are processed, in any given month the company will sell to three major automobile manufacturers and three appliance manufacturers a total of 21,000 different kinds of coil steel.

"We spend a lot of time trying to reduce the number of these products, but it involves the expertise of several hundred people and different metallurgy and chemistry," explains Monteith. He believes the harnessing of this kind of expertise could reduce the complexity in ordering and thus the high number of products.

Work on these innovations and the almost insatiable demand by Armco's manufacturing managers for information products have been pushing IS spending levels up by 7% to 10% a year—to almost $70 million this year. Spending should continue that way, says Monteith, until it reaches a point where expenditures begin to exceed what the company considers to be a normal percentage of sales. Armco's current budget probably exceeds that $70 million mark when you consider the proliferation of microcomputers within the company's various divisions, used in such applications as process control, communications, and data processing. Monteith admits he doesn't have a handle on how much money Armco spends for microcomputing: "We wish we knew how much this amounted to, but we don't."

Photograph by William Strode/Four By Five

Armco's IS operation is counting on CIM and AI.

Gushers of Information

Without IS, the oil business would dry up. Supercomputers help find the black gold, and computers also make possible its recovery, shipment, refining, and delivery.

Although the petroleum and petrochemical leaders spend less than the national average on information systems, their aggregate revenues lead all other sectors. In 1987, they invested 1.3% of revenues totaling $295.5 billion, or $3.8 billion, in IS operations. At the same time, industry profits dipped sharply, but almost solely because of Texaco's $4.4 billion losses. This had only a small, dampening effect on computer and communications purchases this year (even at Texaco), and most of the companies predict a steady growth in their IS budgets for next year. The trend is reflected in a shift of 1988 allocations: these companies will devote a larger share of their budgets to hardware than they did during 1987.

The oil producers are the only companies rivaling the industrial and automotive firms in their love affair with supercomputers. Seismic processing and modeling have a venerable history in the supercomputer field, and with good reason. The computational requirements of analyzing data from seismic recordings and test-well samples could bring mere mainframe computers to their knees. Through the judicious sampling of seismic readings and core data at select sites, geologists use the supercomputers to generate detailed maps of underground strata formations and oil reserves.

This industry was also one of the first to benefit from the application of artificial intelligence to its probems. An early expert system called Prospector employed geological knowledge and the rules of thumb that geologists apply to interpret data from oil well logs. The system helped discover an extension of a known molybdenum deposit in Washington State. Given the high costs of oil and mineral exploration, many of the leading firms in this sector have their own expert system development programs; with them, they hope to automate and replicate the knowledge held by a precious few industry geologists.

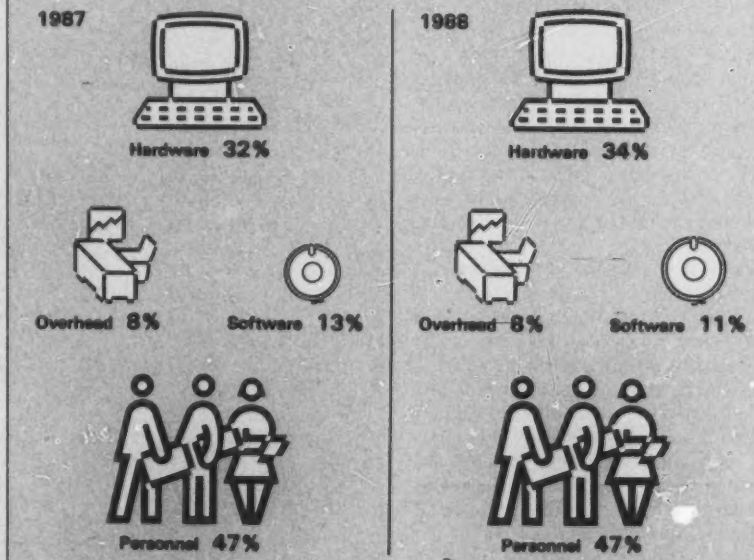
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Exxon Corp.	-	83,300	4,800	12/31
Mobil Corp.	=	56,716	1,258	12/31
Texaco Inc.	=	35,315	(4,407)	12/31
Chevron Corp.	+	28,106	1,007	12/31
Amoco Corp.	=	22,388	1,360	12/31
Atlantic Rich. Corp.	=	17,608	1,224	12/31
Occidental Petroleum Corp.	-	17,096	240	12/31
Tenneco Inc.	+	14,790	(218)	12/31
Phillips Petroleum Co.	=	10,917	35	12/31
Sun Co. Inc.	-	9,428	348	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less. Parentheses represent losses.
Source: DATAMATION

Distribution of IS Funds by Percent

Oil producers rival the industrial and automotive firms in their love affair with supercomputers.



Source: DATAMATION

Once oil is found, its recovery, shipment, and refining all call computer systems into play. Oil movement is a worldwide scheduling dilemma: computers track tank positions and status in addition to oil well productivity and pipeline flows. The refining process itself is a constant customer for computer supervision and control.

On the sales side, the petroleum companies manage huge dealer networks. Here, shipment of product must be coordinated with individual service station demands. The stations themselves are also becoming very automated, and a substantial proportion of some of the oil companies' information systems budgets are directed at this local level.

Many service stations are now equipped with point-of-sale terminals that are linked directly to regional distribution centers. Data from the stations can thus be analyzed quickly for such information as changing consumer demand and individual station performance.

Most companies in this sector view their IS operations as important strategic resources with which to improve the search for oil and to manage more effectively its processing and distribution. And, although their percentage of revenues falls slightly below the average, this can be attributed in part to the relatively high expenses the petroleum and petrochemical firms encounter in the other areas of their day-to-day business operations.

PETROLEUM
CASE STUDY

Arco Ties IS to Inflation

At Atlantic Richfield, a lean IS operation helps the corporation stay on top of costs, keeping the head count down.

BY TOM McCUSKER

Like all other enterprises in the tumultuous petroleum industry, information systems still is considered an expense that should be trimmed. Three years ago at Atlantic Richfield Corp., Los Angeles, the trimming took place. The IS budget was cut 30%, down to $235 million from $340 million. Since then, IS budget increases have been tied to inflation, accounting for this year's modest IS investment of $240 million. Still, Atlantic Richfield makes judicious, if not expensive, use of information systems in the day-to-day running of its nine operating divisions.

"The turmoil in oil pricing makes us extremely cost-conscious," observes Allen N. Smith, manager of corporate information services. Asked how Atlantic Richfield's IS strategies reflect this priority, Smith notes that the company implements systems aimed at keeping the head count down.

When pricing fluctuations began to hit Atlantic Richfield's bottom line, the company decided to eliminate gasoline credit cards, instead offering discounts at its 1,750 stations in the western U.S. Now, it is investigating the use of debit cards and has pilot systems at a number of stations to further automate the delivery of gasoline and other services. Among the schemes currently operating are night-and-day minimarkets, which operate at 630 of the company gasoline stations.

The 1988 budget of $240 million, which includes expenses and depreciation of equipment, is based on the expense and service levels planned by IS operations in each of the company's operating companies, all of which follow the same inflation-rate guidelines. Corporate information systems people, says Smith, maintain a constant dialogue with their users to understand their business needs and to try to implement new technologies. For example, Atlantic Richfield is also beginning to use imaging technology to capture engineering documents for refinery operations.

Smith says Atlantic Richfield makes extensive use of artificial intelligence in its various operations. "So much is going on that I couldn't start to point out any special project," Smith asserts. Expert systems are being applied in the petroleum exploration activity and to analyze chemical spills. They're also being used in business areas, he says. Atlantic Richfield uses an expert system to assist it in formulating its long-range plan. "In reality, it didn't have much effect on the outcome of the plan, but it was a great exercise in getting the rules down and then codifying what we were doing to arrive at the plan."

Photograph by Arthur D'Arazem/The Image Bank

Atlantic Richfield uses AI in operations from exploration to long-range planning.

Going with The Flow

The IS budgets at process industries are a shade below average, but much of the computing—monitoring and control systems—may show up on manufacturing budgets.

Process industries increased their IS expenditures slightly in 1987, although their 1.7% of revenues placed them a bit below the national average. Still, at this rate, the aggregate IS budget of the top 10 corporations in the sector totaled $1.9 billion, out of revenues of $112.4 billion. As in some other industry sectors, such as petroleum and petrochemicals, the below average percentage of revenues devoted to IS doesn't reflect the critical importance of computing. The IS departments at these firms perform vital work in virtually every aspect of the business, from tabulating marketing surveys to controlling production lines to facilitating research activities. The costs of running these systems are reflected in higher 1988 allocations for hardware and overhead, and slightly lower spending on personnel and software.

The most obvious computer application in this sector is the monitoring and control of complex production lines. Process plants face unique manufacturing problems that traditionally have been more difficult to automate than those of factory floors dealing with discrete components and products. The industry is largely analog in nature, and requires the interfacing of devices such as flow meters and pressure and temperature gauges to digital computer programs.

Advanced automation systems in this business model the entire production process, producing detailed graphic displays that report the status of each stage of the operations. Analog dials can be simulated on the computer screens, and in some systems the actual analog controls can be reset remotely by altering the readings on the simulated controls.

Several of the process leaders, including Du Pont and Kodak, invest fairly heavily in computer systems for their research labs. As with the pharmaceutical firms, success at these companies is highly de-

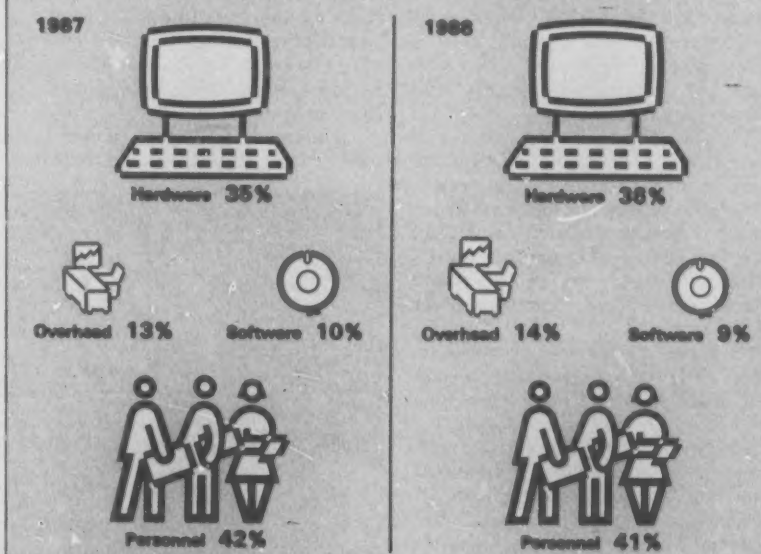
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
E.I. du Pont de Nemours & Co.	=	30,468	1,786	12/31
Procter & Gamble Co.	=	17,163	327	6/30
Dow Chemical Co.	=	13,377	1,240	12/31
Eastman Kodak Co.	+	13,305	1,178	12/31
Georgia-Pacific Corp.	-	8,603	458	12/31
Monsanto Co.	+	7,639	436	12/31
Weyerhaeuser Co.	-	6,990	447	12/28
Union Carbide Corp.	=	6,914	232	12/31
American Cyanamid Co.	=	4,166	276	12/31
Boise Cascade Corp.	=	3,821	183	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; - means less.
Source: DATAMATION

Distribution of IS Funds by Percent

The most obvious computer application in this sector is the monitoring and controlling of complex production lines.



Source: DATAMATION

pendent upon the development of new products and the improvement of old ones. These labs also improve the production processes themselves: slight reductions in waste or improvements in yields can produce substantial savings.

Although many of the administrative tasks at these companies can be addressed by off-the-shelf software packages, the process industry's unique operations require the development of numerous custom applications. As a result, a growing percentage of the IS budgets at the top 10 goes toward the acquisition of computer-aided software engineering (CASE) systems that help boost programmer productivity and hold down personnel costs. CASE systems are especially useful in adapting existing software to changing conditions, permitting the retention of core program instructions upon which necessary modifications can be built.

The task of cataloguing data about product lines—they number in the thousands at companies such as Procter & Gamble— consumes a major portion of processing power. Tracking production at far-flung manufacturing plants, managing inventories, and scheduling shipments requires close integration between departmental minicomputers and corporate mainframes. Controlling the manufacture and distribution of specific product lot numbers is especially important in many cases. Whether they are consumer or industrial products, many have limited useful lifetimes and must be produced in quantities that closely mirror immediate demand.

PROCESS INDUSTRIES
CASE STUDY

IS is Order of Day at Dow

At Dow Chemical, IS is building an order system that promises to improve both the quality and delivery of its products.

BY TOM McCUSKER

Advances in computer power and communications technology are enabling large organizations to detect and handle competitive pressures with a decisiveness and thoroughness that weren't possible as recently as half a decade ago.

Take Dow Chemical Co., the $15 billion Midland, Ohio, chemicals giant, which two years ago began to recognize that competition in its market was heating up. With sales climbing 2% to 3% a year, the company saw the need "to differentiate ourselves from other chemical companies," explains Hans Huppertz, Dow's director of information systems and communications services.

"We sensed that we had to be a little better than the competition to get the business, and that meant an improvement in both the quality and delivery of our products," he adds. "We felt that this had to be done by revamping the way Dow operated our customer service centers and to modernize our order entry and order processing systems."

Dow's information systems operation was handed the job of revamping the company order entry and order processing systems, which were using 15-year-old technology. The project, begun two years ago and not expected to be operational until 1990, is aimed at integrating order processing, which had been done separately and locally at plant sites. Huppertz is reluctant to discuss the cost of the project, but notes that it involves the acquisition of new software both from outside the company as well as from within, and a full-time development staff. In another large project, IS has provided telecommunications support for Dow's consolidation of customer service centers into a central operation at company headquarters.

This year, Dow is spending $275 million for its information systems activity, an increase over last year's expenditure of $264 million. Huppertz says that as information systems gain more stature in the company, the budget will be growing from 3% to 5% a year well into the future. "Top management has been giving IS more recognition, but it's more pronounced now," says Don Rockwell, manager of special projects on Huppertz's staff.

Spending at Dow is determined by a three-year plan that is constantly reviewed by a management group. IS builds the plan based on budgets that are drawn up and submitted to Huppertz's group by all of the company's manufacturing locations. Hardware and software acquisitions are not considered part of the IS expenses; they are considered part of Dow's capital budget and accounted for 6% of its capital spending in 1987.

All of the company's spending for information systems and capital spending are tracked and managed by Huppertz's group. As more and more computing has been done departmentally, however, Huppertz guesses that some spending escapes IS's attention, amounting to perhaps 5% to 6% of Dow's total IS spending. But, as he observes, everything has to be depreciated, and his department won't track depreciation unless it has installed the equipment.

Huppertz says that computing costs assigned to process control in Dow's plants are treated separately from IS. "We interface only by moving information in these sections," Huppertz explains.

New techniques for efficient storage of paper remains a priority among the Dow IS group that tracks new technologies. It is now in the midst of looking for storage guidelines for new forms of archiving that will improve efficiency.

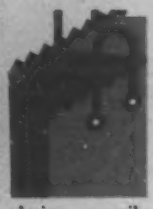
Nevertheless, the company sees increasing use of unattended operations, especially for departmental systems such as IBM's new AS/400, and at its major data centers. It is Dow's long-range goal to run these areas with the only operator being the console operator.

Dow's IS budget grows 3% to 5% a year.

Photograph by Gary Gladstone/The Image Bank

Stocking Up On Information

In retail, the computer's presence is obvious in point-of-sale terminals and credit card transactions. Behind the scenes, IS helps ensure the apple is fresh and the hemline up to date.



As in last year's industry by industry survey, retailers continue to lag behind other industries in budgeted IS expenditures. Collectively, the leading U.S. department store and supermarket chains contributed just 0.4% of their $167.5 billion in 1987 revenues to IS operations, resulting in an aggregate budget of $670 million. Retailers spend a higher proportion of their IS budget on hardware than do companies in most of the other sectors. During 1988, they show a marked decrease from 1987 in their budget for personnel. Although this saving is slightly offset by budgeted increases in overhead, these companies appear to be striving for improved efficiency.

Nevertheless, most companies in this sector expect a gradual rise in their IS budgets, partly due to the cost of new technologies and partly to keep pace with rising computer personnel salaries. Applications programmers are in particularly short supply in this sector. Although some retailers are increasing their reliance on canned software for their administrative, inventory, and financial needs, most still customize at least part of the packages to better fit specific application demands.

Differences still remain between the department store chains and the supermarkets, most notably in the former's reliance on credit card sales. This often requires the linking of card reading equipment to verification networks maintained by the card issuers, and devoting considerable in-house computer time to processing these transactions. Supermarkets, on the other hand, are increasingly dependent on bar code reading, point-of-sale terminals. As well as permitting more rapid and more accurate servicing of customers, these systems can be tied into each corporation's product ordering and warehousing operations.

Some chains are experimenting with computer-based videotex systems to expand customer support services with-

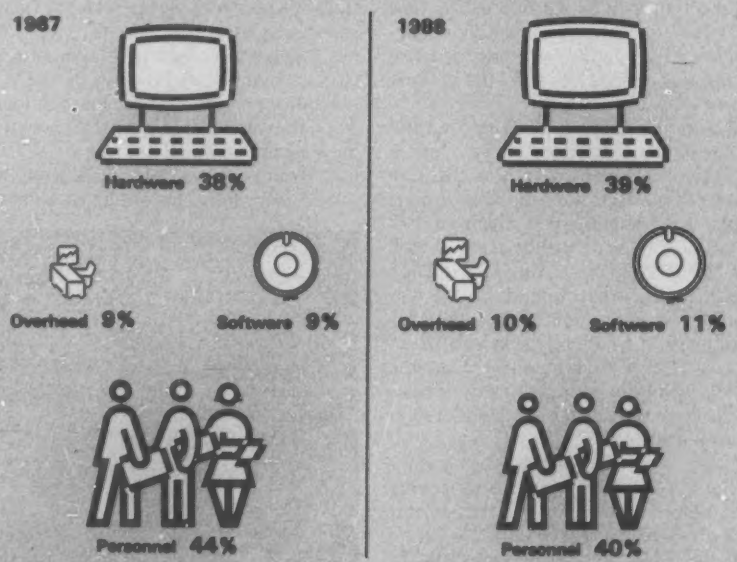
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
Sears, Roebuck & Co.	+	48,440	1,649	12/31
K Mart Corp.	+	25,627	692	1/27
The Kroger Co.	=	17,660	247	12/31
J.C. Penney Co. Inc.	+	15,333	608	12/31
American Stores Co.	=	14,272	154	12/31
Federated Dept. Stores Inc.	=	11,117	313	2/1
Dayton Hudson Corp.	+	10,677	258	2/1
The May Dept. Stores Inc.	=	10,314	444	12/31
F.W. Woolworth Co.	=	7,134	251	12/31
Lucky Stores Inc.	=	6,925	152	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Retailers spend a higher proportion of their IS budgets on hardware than do companies in most of the other sectors.



Source: DATAMATION

out adding to personnel costs. Often equipped with self-explanatory touch screens, the videotex units contain information on merchandise locations, current sales programs, and product features. The stores hope such systems may also stimulate sales of featured products, but many question the potential of videotex to reduce appreciably the desire of customers to interact directly with salespeople.

Retailers are also starting to play catch-up in the use of satellite communications facilities. As the voice and data traffic of supermarket department store chains increases, many are exploring the cost savings and efficiencies to be gained through satellite communications. The capability to transmit information from corporate headquarters simultaneously to multiple store sites across the country is particularly attractive in this sector.

Inventory management and control is a major operational aspect of department stores and supermarkets alike. The type of retail store influences the nature of inventory warehousing and shipments, with lower-margin, faster-turnover mass merchandise chains requiring more computational support with their inventories than the higher-margin, more stable lines in department stores. Of course, supermarkets are especially dependent upon inventory tracking and product shipment, since so many of their goods are perishable. To cut losses from product shortages or oversupplies, supermarkets look to on-line communications with their suppliers to ensure a steady flow of products and to keep their shelves fully stocked.

RETAIL
CASE STUDY

Lucky Returns to Roots

Information systems at Lucky Stores aims at using technology to enhance stockholders' return on investment.

BY TOM MCCUSKER

Lucky Stores Inc. of Dublin, Calif., once a high-flying retailing conglomerate, has returned to its core business—a big supermarket chain with 350 stores in California, emphasizing quick -in-and-out shopping at low prices.

Lucky once ran a chain of general merchandising discount stores, an auto parts chain, and assorted food-related operations throughout the U.S. In 1986, it began to sell off operations to fight an unfriendly takeover attempt by a group led by New York investor Asher Edelman. As of December 1987, Lucky had unloaded five companies and was back to the grocery business.

But there's more to the story. Earlier this year, it was acquired for $2.5 billion by American Stores Co. If the acquisition receives final approval, American Stores' Alpha Beta supermarket chain of 247 stores in California will be merged with the 350-store Lucky chain. The existing information systems operation at Lucky would serve the combined operation. According to Don Hillery, Lucky's data center director in Dublin, the job of the service would be straightforward: to use technology to enhance stockholders' return on investment.

Hillery's data center provides computing power for the company's remaining four divisions in a sort of centralized/decentralized IS organization. Two years ago, the IS function was decentralized. In the restructuring that enabled the company to stave off Edelman's takeover attempt, the company essentially centralized computing power in Dublin. The data center that Hillery runs provides the computer power and networking services, while applications development is performed by a Dublin-based IS operation.

This year, all but $10 million of Lucky's $40 million IS spending will be for the data center and the information systems function. The rest will cover hardware and development work done at Lucky's four divisions in northern and southern California. Each of these divisions, with its own vice president of data processing, essentially sets its own priorities for use of central development services and computing power at Dublin.

While these divisions pay for their local work, they also are billed by Dublin on the basis of cpu use. That's a change, says Hillery, from previous practices where customers were billed according to number of hours connected to the data center. "Now, these customers learn to optimize their cpu usage and have developed knowledge of techniques such as determining whether DASD or tape storage should be used in particular cases," he asserts.

The overall information systems budget is based on history as well as estimates from Lucky's various user divisions, Hillery explains. "We ask them in the budgeting process what their requirements are for the coming year, the level of computer support they'll need, and what they expect to want in applications development."

The company's current emphasis is on expert systems to help stores better meet the needs of customers. "In the old days, we adopted a single store format and replicated it 100 times. Today, stores are run differently according to the neighborhoods they serve," says Hillery.

Lucky Stores runs a combination centralized/decentralized information systems operation.

Photograph by Ben Mitchell/The Image Bank

TRANSPORTATION
OVERVIEW

Planes, Trains, and IS

Where is it? How do I get there? The two biggest questions in the transportation industry couldn't be answered without IS.

Despite the obvious computer presence in airline operations, the transportation industry top 10 devoted only 1.3% of their $58.2 billion revenues in 1987 to information systems. Still, this percentage amounted to $757 million, and the IS budgets at these companies will grow faster than most, as the industry players try to control well-publicized problems like faulty maintenance, flight delays, and lost luggage. Meanwhile, computers are taking on new importance at the headquarters and switching yards of train operators.

The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
UAL Inc.	+	8,293	355	12/31
CSX Corp.	+	8,043	432	12/31
AMR Corp.	+	7,198	198	12/31
Burlington Northern Inc.	-	6,621	(529)	12/31
Union Pacific Corp.	=	5,943	583	12/31
Santa Fe Southern Pacific Corp.	=	5,448	345	12/31
Delta Air Lines Inc.	=	5,318	264	6/30
Norfolk Southern Corp.	-	4,112	178	12/31
Trans World Airlines Inc.	-	4,056	106	12/31
Federal Express Corp.	+	3,178	(66)	12/31

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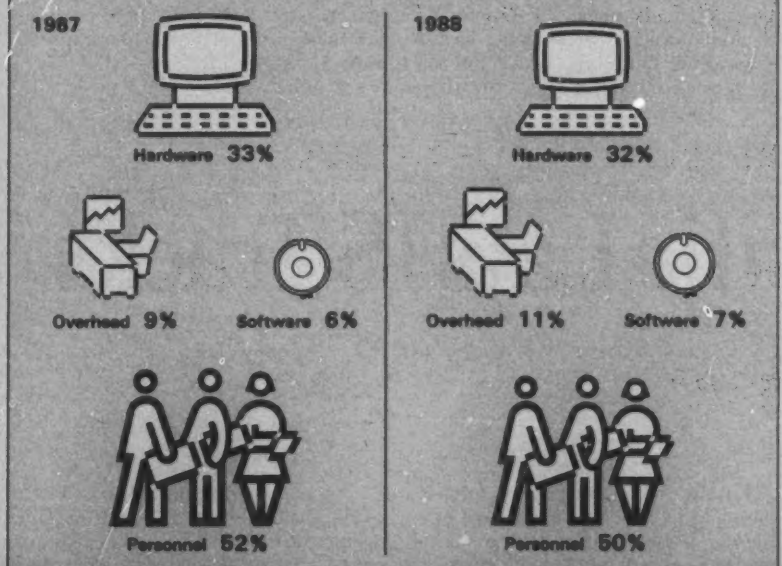
Distribution of IS Funds by Percent

Airlines turn to their IS departments for everything from control of basic operations functions to fuel management programs.



Source: DATAMATION

Computer-based reservation systems remain the mainstay of the airline industry, and these worldwide networks are constantly being upgraded and modified. American Airlines' SABRE (Semi-Automated Business Reservation Environment) system, for example, is adding electronic mail and office automation functions to its repertoire. American is trying to get its 14,000 SABRE subscribers to trade in their old networked terminals for IBM Personal System/2 workstations, which can run the new programs locally. By pushing the idea of PS/2 workstations within the agencies, American is establishing the basis for future system enhancements that will run on the systems.

Government surveys over the past year confirm what air travelers have known for some time: the on-time performance of most airlines has been steadily declining. The new Federal Aviation Administration policy of reporting comparative performance figures for the airlines has resulted in the intensification of computer-based efforts to better manage plane scheduling—for flight departure and arrival as well as for maintenance. The airlines are also attempting to become more efficient internally, cutting costs by turning to their IS departments for everything from control of basic operations to fuel management programs. The need for this emphasis is shown in 1988 budget increases for overhead relative to 1987; meanwhile,

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hardware spending has fallen slightly.

The frequent flyer programs maintained by the airlines also consume a healhty share of transportation computer resources. The travel activity of club members is tracked and tabulated, and periodic statements are generated to apprise members of their accumulated mileage and travel bonus options.

Long the also-rans to airlines in computer usage, the railroads are now upgrading their corporate IS operations, finding new areas in which to apply computer technology. These firms place a premium on maintaining detailed information about equipment locations, train movements, and traffic patterns. Trains must be coordinated with the arrivals and departures of container ships, and cargo progress tracked. In addition, on-board automated train control systems are now in developmental stages. These automated solutions will further distribute the task of operating the trains and should improve train efficiency and safety.

When it comes to tracking the location and status of its charges, though, none of the airline or train companies can compare with Federal Express. The job of scheduling pickups and deliveries of overnight packages has intensified as competition in the field has grown. Fed Ex took a loss in 1987, but it still devoted a higher percentage of its $3.2 billion in revenues to IS than the rest of the big 10 transportation companies.

TRANSPORTATION
CASE STUDY

Union Pacific Lays IS Tracks

At the venerable railroad giant, IS builds systems that stop and start trains, prevent collisions, and save big money.

BY TOM McCUSKER

The railroad operations of Union Pacific Corp. have been around for 170 years, providing rail transportation in the western three quarters of the nation, and, through right-of-way holdings, providing huge sources of tax revenues to federal, state, and local governments. Railroads also are recognized as dangerous operations, particularly at railroad crossings. For years, railroads have been operated as highly labor-intensive services.

It was relatively easy for the company's information systems to facilitate the handling of multiple revenues reports to various tax departments at all levels of government, as well as to render the reports certifying that the company meets safety requirements.

However, it is in applying information technology to reduce labor-intensive work in its transportation operations that the real challenges exist, says Guerdon Sines, vice president of information and communications systems.

That's the problem the company is now attacking. First, it is using computer control to dispatch trains electronically in railroad yards. It is bringing in microcomputers on locomotives that read transponder data from the rails. These enable locomotive odometers to be tracked automatically to within one tenth of a mile by people who monitor safety. The system advises engineers of deviations from preset speed limitations; and can take control of the locomotives from the engineers and shut them down, says Sines.

This contributes to safety and leads to savings in fuel. For example, on single rails where trains running in opposite directions must pull off onto sidings in order to pass each other, speeds can now be controlled so that both trains reach their sidings at the same time and neither has to stop. Much of the way this new technology works, says Sines, is analogous to the way planes navigate electronically.

To enhance its competitiveness with other modes of transportation, Union Pacific uses its networks to provide electronic data interchange for ordering, billing, and paying of invoices, and also has been encouraging its customers to tie the railroad's facilities into their just-in-time manufacturing schedules. Sines says that most JIT systems are tied to motor carriers rather than to the railroads, but he foresees a greater linkage in the future.

Union Pacific uses IS to dispatch trains.

Photograph by G.M. Smith/The Image Bank

Union Pacific's budget process closely follows long-range systems plans that extend out by five years. The plans, of course, are changed yearly as priorities are given to projects that have the closest relation to the firm's overall strategies. Users consult with Sines' information systems group in planning their projects, and a committee of three senior vice presidents give the projects their final stamp of approval. "While I don't approve expenditures, all spending must have my endorsement," Sines explains.

This year, Union Pacific is spending $110 million in information systems for the railroad, virtually the same sum as in 1987. Its spending five years out actually could decline, says Sines, but then, "at any time, our budget can be squeezed or expanded as we envision cogent rates of return." It has some leeway, too: this year, information systems spending represents only 3% of total capital spending of $650 million. In such organizations, people begin worrying when the figures start to hover around 7%.

Sines looks to imaging technology as an attractive new method for Union Pacific to handle accounts payable. While many customers handle such systems electronically, vast numbers still send written messages—or images—which Union Pacific then will enter into the system as an image.

Calling All Computers

Maintaining up-to-date data on millions of customers makes the utilities big users of information systems. The leaders make do with near-average IS budgets.

AT&T and its offspring dominate the leadership ranks of the utility companies, with only two other firms—the phone-oriented GTE and the Southern California Edison electric utility—making it into top 10 spots. As a group, the utilities spent 2% of their $126.3 billion 1987 revenues on corporate information systems. This translated into an aggregate information systems budget of $2.5 billion for the year. However, since for the most part the telephone companies' computer-based switching systems and transmission facilities fall outside of the corporate IS budgets, actual industry expenditures on processing equipment are considerably larger than indicated in the IS budgets.

As these companies prepare for competition in their markets and for new trends in regulation (price cap versus rate of return), their 1988 budget allocations show important cuts in overhead and personnel items. It is important to keep these costs low in competitive markets.

The phone companies have devoted considerable expense to upgrading their customer billing systems. Although much of the call data collection equipment is an off-budget expense, the disk drives that store these data and the mainframe computers that process them into bills represent a sizable portion of the IS operations at telephone utilities.

The billing focus is equally important at Southern California Edison and the other electric utilities that didn't quite make the top 10 listing. Although the metered billing at the electric companies is more straightforward than that for the varied-service phone companies, producing hundreds of thousands of monthly statements is no trivial task.

The immense size of these firms requires the maintenance of extensive records on thousands of employees. Because of the information-intensive nature of the

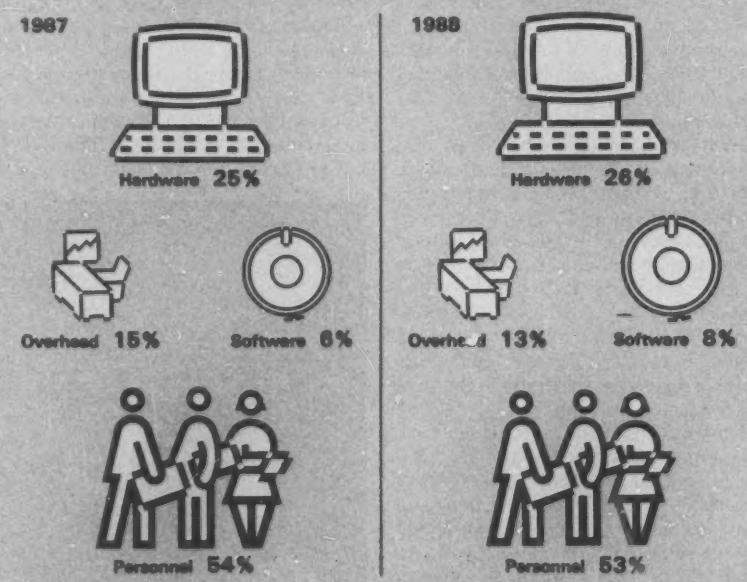
The Top 10

COMPANY	IS INTENSITY	REVENUE ($ MIL)	PROFIT ($ MIL)	FY END
AT&T Co.	+	33,598	2,044	12/31
GTE Corp.	=	15,421	1,119	12/31
Bell Atlantic Corp.	=	12,298	1,240	12/31
BellSouth Corp.	+	12,269	1,665	12/31
Nynex Corp.	=	12,084	1,227	12/31
Ameritech Corp.	+	9,536	1,188	12/31
Pacific Telesis Group	=	9,131	950	12/31
U.S. West Corp.	=	8,445	1,006	12/31
Southwestern Bell Telephone Co.	–	8,003	1,041	12/31
Southern Calif. Edison Co.	=	5,493	789	12/31

* = means company spends about the same percentage of its revenue on IS as the group mean; + means it spends a larger percentage; – means less.
Source: DATAMATION

Distribution of IS Funds by Percent

Increased competition has forced cuts in overhead and in personnel allocations.



Source: DATAMATION

industry, a high percentage of these employees require desktop personal computers and workstations. As a result, the utilities represent a fertile market for office automation technologies. This is one area where, in many cases, existing software for applications such as electronic mail can be purchased and installed without modification.

Appropriately, the phone network operators are also major purchasers of local area computer networks, by which means they connect departments and employees to one another and to shared disk, printing, and communications bank facilities.

The lifeblood of these companies is the supply and maintenace of universal service in their given territories, and their IS departments are under constant pressure to improve the speed and efficiency of providing that service. Substantial resources are devoted to managing incoming orders to disconnect old phone lines and connect new ones. The relatively recent options to add features such as call forwarding and call waiting have added to the complexity of this process, with increasing numbers of customers requesting service changes. Many areas see a seasonal peak in such activity in August and September with returning student populations and turnovers in rental apartment occupants. A certain amount of overcapacity must be built into the IS department computers to handle these crunch periods.

UTILITIES
CASE STUDY

Switching to a Party Line

This huge communications utility is simplifying a complex mix of systems, aiming at corporatewide commonality.

BY TOM McCUSKER

Ameritech Corp. of Chicago is an amalgamation of five independent Bell operating companies in five states, each with different applications architectures—a situation that the company says it is rushing to change.

The problem will require large amounts of money and considerable time to solve. It is aggravated by a perceived need within the organization to react more quickly to customers' needs with more cohesive information systems, says Todd Glenn, vice president of information services with Illinois Bell, Chicago. (Illinois Bell and telephone companies from Michigan, Indiana, Ohio, and Wisconsin comprise the Ameritech utility.)

With nine data centers, 650 employees in information systems, and $220 million invested in computer systems, Illinois Bell is one of Ameritech's larger units. Its annual IS budget of $100 million is a third of the total $300 million to be spent for IS at Ameritech this year. Its first implementation of a common system was the installation this year of a carrier access billing system. Illinois Bell was selected first because it represents a hefty 15% chunk of the company's revenues.

Early next year, all five companies will have a common payroll system and toward the end of 1989 will install a message processing system that will be common to all the companies. A common information system—essentially a single-service method to bill customers—will be implemented at the companies over a three- to four-year period, beginning at the end of 1989.

In its drive for a more cohesive information systems organization, Ameritech last month launched a facilities management organization, Ameritech Applied Technologies, to serve as a support system for all of the company's operations. During the six months since it was organized, AAT has absorbed much of the computer power and computer people from the company's five telephone companies. Its first function will be to act as an IS support system for customer service ordering, and billing.

Glenn says IS spending starts when Ameritech units establish net income commitments for review by management. What the units must spend to achieve these net income commitments, such as for IS, are examined against an existing five-year IS budget that, when necessary, is then revised up or down. At Illinois Bell, the $100 million to be spent this year is about 8% higher than in 1987.

Looking forward through 1992, Glenn expects IS spending to rise each year as the company launches additional projects to achieve commonality, but with the reorganization and the establishment of Ameritech Applied Technologies, he says he's unable to conjure a firm number.

More and more, Glenn observes, customer departments within Ameritech are demanding a greater say in the way their IS systems are set up and run. For example, they wanted access to a centralized source of more sophisticated applications until a fire outside of Chicago last May crippled telephone communications. "Now they want redundancy," Glenn says. He adds that customers rarely demand new technologies, but rather new functions. "We use new technology to deliver that functionality."

Photograph by Al Satterwhite/The Image Bank

Ameritech has 650 IS workers and about $220 million invested in computer systems.